My approach to Barlow's disease

Patrick M. McCarthy

Division of Cardiac Surgery, Northwestern University Feinberg School of Medicine and Northwestern Medicine Bluhm Cardiovascular Institute, Chicago, IL, USA

Correspondence to: Patrick M. McCarthy, MD. Executive Director, Vice President of Northwestern Medical Group, Heller-Sacks Professor of Surgery, Division of Cardiac Surgery, Northwestern University Feinberg School of Medicine and Northwestern Medicine Bluhm Cardiovascular Institute, 676 North Saint Clair Street, Arkes Family Pavilion, Suite 730, Chicago, IL 60611-2908, USA. Email: Patrick.McCarthy@nm.org.

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Introduction

Most patients are somewhere between the extremes of fibroelastic deficiency and Barlow's disease. From the surgeon's perspective, it is more helpful to look at the pathology as posterior leaflet involvement only (80%); bileaflet disease (15%; Barlow's disease is in this group), and anterior leaflet involvement only (5%).

For all three types of degenerative mitral repairs, there should be two main goals in the mind of the surgeon: achieve a coaptation length (CL) of 5–10 mm on each leaflet, and eliminate residual prolapse or restriction. With too much coaptation, there is a risk for systolic anterior motion (SAM), too little, and there is residual mitral regurgitation (MR). Achievement of the two goals should result in no residual MR or SAM.

Posterior leaflet

My standardized approach to posterior leaflet prolapse applies to both posterior only and bileaflet disease (1). The main concept is that I use numbers, not judgement, to guide repair, which removes guesswork out of mitral repair and reduces variability in results. Transesophageal echo (TEE) provides two critical numbers, leaflet length at A2, and the "C-Sept" (coaptation point to the septum in systole) (1). In addition to TEE, I use calipers (Scanlan International, St. Paul, MN, USA) and directly measure: (I) A2 and other leaflet segments to guide the leaflet reconstruction; and (II) the length of the reconstructed posterior leaflet. Using resection (not neochords) to repair posterior leaflet disease, I target leaflet reconstruction to half the length of A2 (recreating normal 2:1 anterior to posterior length), or 15 mm maximum (reducing the risk of SAM). A typical repair has an A2 of 28 mm, and the reconstructed posterior leaflet is adjusted to 14 mm. I perform a measured partial folding plasty instead of sliding plasty (2). Clefts are closed between segments for defects >3 mm with free edge "remodeling" of any small abnormalities. These interrupted sutures smooth the leaflet surface along the coaptation area, minimizing irregular surfaces which create small residual jets. The completed repair should be symmetric when the left ventricle is filled with saline, indicating no residual prolapse or restricted motion.

Anterior leaflet

The anterior leaflet requires multiple tools and oftentimes requires a combination of techniques (3). I use the Carpentier techniques for the anterior leaflet, and did not adopt neochords due to my experience with reoperations sent from outside institutions after failed neochord repairs. The most common (46%) technique in bileaflet prolapse is chord transfer of normal length chords from the resected mid-body of P2 to A2 (described in detail in the associated video and manuscript) (4). Commissuroplasty is used, typically with other techniques, in 30% of bileaflet repairs,

and edge-to-edge (Alfieri repair) in 6.4% of repairs overall, and in 11% of bileaflet repairs. Posterior leaflet resection with a ring and no specific anterior leaflet treatment is used if the anterior prolapse is less than 3 mm and the chords appear normal (18% of bileaflet repairs).

Sizing and SAM

All patients receive a complete remodeling ring, and sizing is based on the A2 length, reconstructed posterior leaflet length (typically half of A2), and the antero-posterior (AP) diameter of the ring (not the commissure-to-commissure distance reflected in ring sizes). CL is easily calculated, and post-pump TEE-measured CL is highly accurate within 1–2 mm of predicted CL in my experience (1). A recent study showed that in 100% of patients, the CL fell within the 5–10 mm target. SAM is the surgeon's fault, typically caused by a posterior leaflet left too long (>15 mm), and/or a ring with an AP diameter that is too small (creating a CL >10 mm), and occurs in 0.3% in our series (1,5). A C-Sept of 25 mm or less on TEE indicates an increased risk for SAM. In this instance (approximately 15%), the posterior leaflet can be reconstructed shorter by 2–4 mm, or a slightly larger AP diameter ring can be used.

Results

We published a 98% repair rate, with 0.2% 30-day mortality, and reduction in MR grade (0–4 scale) from 3.8 pre-operatively to 0.07 on predischarge echo (3). The 10-year results for posterior only, anterior only, and bileaflet disease are the same in our Northwestern series (3). Among these three groups of leaflet prolapse, there was no significant difference in long-term survival, freedom from mitral valve reoperation or transcatheter intervention, and freedom from > moderate MR. Mitral repair "failure" (any reintervention, or > moderate MR) occurred in 1.9%. Recent 10-year studies show failure using neochord repairs are much higher than this (3). Concomitant atrial fibrillation was treated in 100% of patients with modified Cox-Maze III cryoablation since 2013 (6). The low early risk and high late durability of these techniques led to early patient referral (50% being asymptomatic pre-operatively) (7). Our results reflect the precision of a measured approach, eliminating the variability of surgical judgement and neochords, and the Northwestern program and trainees have adopted this strategy and techniques.

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Footnote

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